Claims

1. A method for generating a mathematical model of thermal steady state printing characteristics of a thermal printing system using a computing device, the thermal printing system comprising a thermal printer having a thermal head (2) incorporating a plurality of energisable heater elements (4) and a heat sink (24), and a thermographic material (10), said method comprising:
   - making a reference printout on the thermographic material (10), said reference printout consisting of several printed regions with each of the several printed regions being printed with a different steady state amount of heat energy (E_n) delivered to the heater elements (4),
   - determining a measure of the graphical output (d_n) in function of at least a parameter relating to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output (d_n) was printed in a thermal steady state,
   - establishing the mathematical model by determining a best fit relationship between the measures of the graphical output (d_n) in function of at least the parameter related to the heat sink temperature and the steady state amounts of heat energy (E_n).

2. A method according to claim 1, wherein the heat energy is represented by a given equivalent time (t_{exc}) used for powering the heater element (4) with an equivalent constant power (P_0), $E_n=t_{exc}*P_0$.

3. A method according to claim 1, furthermore comprising, while making the reference printout, logging of parameters (P_j) that are determinative to the graphical output (d_n).

4. A method according to claim 1, comprising establishing a table (T) of data comprising the steady state graphical output function (d_n), and the used energy (E_n or t_{exc}), giving an implicit relationship between the graphical output function (d_n) and its controlling parameters (E_n or t_{exc}).

5. A method according to claim 4, the table (T) furthermore comprising the parameters (P_n) that are determinative to the graphical output (d_n).

6. A method according to claim 4, wherein the best fit relationship is a parametrisable function (f()), being defined by a set of unknown coefficients (a,b,c,d,...) found using a curve fitting process on the table (T).

7. The method according to any of claim 1, wherein a printing pattern of said reference printout is selected so that the pixels being printed do not interact with each other.

8. The method according to claim 1 wherein the best fit relationship is given by $d_i=f(t_{exc})$ where t_{exc} is an excitation time of a heater element and this relationship is corrected when using the printing system at a different line time by adding an offset Δt_{exc} to t_{exc}, Δt_{exc} being found as the value that full-fills the equation

$$\sum_{i=0}^{\infty}\frac{1}{(2i+1)^2}\cdot\left[e^{-(2i+1)^2\left(\tau_{line}^{ref}-\tau_{exc}\right)}-e^{-(2i+1)^2\tau_{line}^{ref}}\right]=\sum_{i=0}^{\infty}\frac{1}{(2i+1)^2}\cdot\left[e^{-(2i+1)^2(\tau_{line}-(\tau_{exc}+\Delta\tau_{exc}))}-e^{-(2i+1)^2\tau_{line}}\right].$$

9. The method according to claim 1, wherein said graphical output (d_n) is a pixel with a certain colour spectral density in the centre of the pixel and/or a pixel with a certain size defined by a perimeter having a given colour spectral density, to be reproduced on said thermographic material (10).

10. A method for driving a thermal print head of a thermal printing system comprising a thermal printer having the thermal print head (2) incorporating a plurality of energisable heater elements (4) and a heat sink (24), and a thermographic material (10), said method comprising:
in a first mode establishing a mathematical model by:
- making a reference printout on the thermographic material (10), said reference printout consisting of several printed regions with each of the several printed regions being printed with a different constant amount of heat energy (E_n) delivered to the heater elements (4),

- determining a measure of the graphical output (d_n) in function of at least a parameter related to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output (d_n) was printed in a thermal steady state,
- establishing the mathematical model by determining a best fit relationship between the measures of the graphical output (d_n) and the constant amounts of heat energy, and,

in a second mode:

- determining a heat energy to be supplied to at least one energisable heater element (4) in accordance with the mathematical model for printing of an image on a thermographic material (10) using a thermal printing system comprising a thermal printer having a thermal print head (2) incorporating a plurality of energisable heater elements (4) and a heat sink (24), and a current value of the parameter related to the heat sink temperature.

11. A method according to claim 10, wherein the heat energy is represented by a given equivalent time (t_{exc}) used for powering the heater element (4) with an equivalent constant power (P_0), $E_n=t_{exc}*P_0$.

12 A method according to claim 10, furthermore comprising, while making the reference printout, logging of parameters (P_j) that are determinative to the graphical output (d_n).

13. A method according to claim 10, comprising establishing a table (T) of data comprising the steady state graphical output function (d_n), and the used energy (E_n or t_{exc}), giving an implicit relationship between the graphical output function (d_n) and its controlling parameters (E_n or t_{exc}).

14. A method according to claim 13, the table (T) furthermore comprising the parameters (P_n) that are determinative to the graphical output (d_n).

15. A method according to claim 13, wherein the best fit relationship is a parametrisable function (f()), being defined by a set of unknown coefficients (a,b,c,d,...) found using a curve fitting process on the table (T).

16. A method according to claim 10, wherein a printing pattern of said reference printout is selected so that the pixels being printed do not interact with each other.

17. A method according to claim 10, wherein the best fit relationship is given by $d_i=f(t_{exc})$ where t_{exc} is an excitation time of a heater element and this relationship is corrected when using the printing system at a different line time by adding an offset Δt_{exc} to t_{exc}, Δt_{exc} being found as the value that full-fills the equation

$$\sum_{i=0}^{\infty}\frac{1}{(2i+1)^2}\cdot\left[e^{-(2i+1)^2\left(\tau_{line}^{ref}-\tau_{exc}\right)}-e^{-(2i+1)^2\tau_{line}^{ref}}\right]=\sum_{i=0}^{\infty}\frac{1}{(2i+1)^2}\cdot\left[e^{-(2i+1)^2(\tau_{line}-(\tau_{exc}+\Delta\tau_{exc}))}-e^{-(2i+1)^2\tau_{line}}\right].$$

18. A method according to claim 10, wherein said graphical output (d_n) is a pixel with a certain colour spectral density in the centre of the pixel and/or a pixel with a certain size defined by a perimeter having a given colour spectral density, to be reproduced on said thermographic material (10).

19. A control unit for use with a thermal printer for printing an image onto a thermographic material, the thermal printer having a thermal head incorporating a plurality of energisable heater elements, the control unit being adapted to control the driving of the thermal printer so as to make a reference printout on the thermographic material, said reference printout consisting of several printed regions, the driving of the thermal printer being such that each of the several printed regions is printed with a different constant amount of heat energy delivered to the heater elements, the control unit furthermore being adapted to determine a measure of the graphical output for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal state, and the control unit furthermore being adapted to establish a mathematical

model of thermal steady state printing characteristics by determining a best fit relationship between the measures of the graphical output and the constant amounts of heat energy.

20. A control unit according to claim 19, the control unit furthermore being adapted for determining a heat energy to be supplied to at least one energisable heater element in accordance with the mathematical model.

21. A thermal print head provided with a control unit according to claim 19.

22. A computer program product for executing the method as claimed in claim 1 when executed on a computing device associated with a thermal print head.

23. A machine readable data storage device storing the computer program product of claim 22.